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Integrated Environmental and Economic Accounting in China: Proposed Framework and Preliminary Findings

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Abstract: This paper firstly introduced the background, preliminary experiences and the latest development of the undergoing study on the Chinese System of Integrated Environmental and Economic Accounting. Then it put focus on the introduction of the progress of the study on Chinese Environmental and Economic Accounting under the leadership of State Environmental Protection Administration (SEPA) and National Bureau of Statistics of China (NBSC). It also analyzed the main problems that affect the study of China SEEA. Finally the paper discussed the future of China SEEA and proposed some suggestions for it.

Key words: System of environmental and economic accounting, Green National Accounting, Study, Initial result

1 Introduction

The System of Integrated Environmental and Economic Accounting (SEEA) is also called as System of Natural Resource, Environmental and Economic Accounting or Green National Accounting System, which refers to a set of theoretical method for natural resources, environmental and economic accounting. It brings together economic and environmental information in a common framework to measure the contribution of the environment to the economy and the impact of the economy on the environment. It provides policy-makers with indicators and descriptive statistics to monitor these interactions as well as a database for strategic planning and policy analysis to identify more sustainable paths of development. In order to have a better understanding on the concept of SEEA for the common, it is also called “Green GDP” for short.

1.1 Background

Since the implementation of reform and opening-up program in 1978, China has made remarkable achievements on economic development. China’ GDP increases with an average annual growth rate of above 9%, and the total output value of economy increases sixfold and leaps to the sixth place in the world. However, with rapid development of economy, relative shortage of resources, a fragile ecological environment and insufficient environmental capacity are becoming critical problems hindering China's development. In order to transform extensive economic growth pattern fundamentally, the new development strategy of “adhering to the principle of people-oriented, setting up a comprehensive, coordinated and sustainable development concept, and realizing unity of urban and rural development, unity of regional development, unity of economic and social development, unity of harmonious development between human and nature, and unity of domestic development and opening to the outside world” was put forward by Chinese government.

In accordance with the instruction of "to conduct research on green national economic accounting methods, to explore assessment system on economic development level taking resources consumption, environmental damage and benefit in the development process into consideration, to set up and maintain the balance between the human beings and nature", which was made by the Secretary General Hu Jintao at the Central Working Meeting for Population, Resources and Environment in 2004, the research on the SEEA was jointly conducted by the State Environmental Protection Administration (SEPA) and the National Bureau of Statistics of China (NBSC) in March of 2004. At the same time, in order to support SEEA research and lay foundation for the establishment of national system of integrated environmental and economic accounting, SEPA and NBSC started to select pilot provinces and cities across the country to conduct experimental work on green national economic accounting and economic loss caused by environmental pollution. According to the voluntary and regional proportional principle, Beijing, Tianjin, Chongqing and seven provinces of Hebei, Liaoning, Anhui, Zhejiang, Guangdong, Hainan and Sichuan are selected as the pilot cities or provinces. The experimental work started in July of 2005 in due form.

1.2 Preliminary Experiences

In the recent years, the issue of natural resources and environment has aroused common concern of the world. Many experts, scholars, governmental sectors and international organizations are engaged in the settlement of environmental issues and conducting accounting on resources and environment and bringing it into the national economic accounting system. In the Agenda 21 approved by the United Nations Conference on Environment and Development (UNCED) held in 1992, it is pointed out that "The resulting systems of integrated environmental and economic accounting (IEEA) should be established in all member States, better methods should be sought out to calculate values of natural resources and other contribution of environment, accounting for gross national production value should be expanded to adapt to the system of integrated environmental and economic accounting and complement traditional accounting method for GDP and production value". Afterwards, "The System of Integrated Environmental and Economic Accounting (SEEA)" was issued by UN Statistics Agency in 1993 and further improvement was made on the accounting system in 2000 and 2003 respectively based on the practices of member states. Even though there are many pendant theoretical problems, it still provides a common framework for calculation of total amounts of green national economic accounting, natural resources account and pollutants account and draws an intact outline for Environmentally Adjusted Domestic Production (EDP), which could be an instructional and reference document of authority for green national economic accounting.

With rapid development of economy and sharpening conflicts between economic development and environmental protection, Chinese government gradually attaches great importance to the research on environmental accounting and introducing it into national economic accounting system. Many research institutions and governments have conducted a series of researches and practical work on the theories of environmental accounting including methodology on physical quantification and monetary valuation of resources and environment, shortcomings of current national economic accounting system, feasibility on introducing environmental accounting into

national economic accounting system and related modality, theories and approaches. The implementation of the following projects laid solid base for the constitution of Green GDP accounting system in China: 1) National Environmental Pollution Cost and Ecological Damage Valuation was conducted by China Research Academy of Environmental Science in 1980's; 2) Project Team for resources accounting and integrating it into National Economic Accounting System was set up by Development and Research Center of the State Council in 1988; 3) Calculation of Genuine Saving was jointly conducted by SEPA and the World Bank (WB) in 1998 in which Yantai City of Shandong Province and Sanming City of Fujian Province were selected to make experiments; 4) At the beginning of 2000, SEPA and WB began to conduct Research on Valuation Approaches for Chinese Environmental Pollution Cost. At present, they are calculating environmental pollution cost in 2003[1]; 5) During 1998-2001, energy account covering 25 kinds of major energy was developed jointly by NBSC and Statistics Norway; 6) In 2002, the Program of Environmental Physical Quantification Calculation in the Reform of National Economic Accounting System, namely Environmental Satellite Account Program[2], was carried out by SEPA at the request of NBSC; 7) In 2004, the research on environmental index systems for building a well-off society in all-round way and for assessment on leaders performance was conducted by SEPA with aid of NBSC and Organization Department of CCCPC; 8) In 2004, the Framework Research on Green National Economic Accounting System, one of key technology R&D programmes during the Tenth Five-year plan period, was conducted by Renmin University of China with cooperation of Chinese Academy for Environmental Planning (CAEP) of SEPA. The research results have also got through appraisal by the experts.

In addition, the related researches were also conducted at local level. For example, Chongqing Statistic Bureau and Peking University jointly conducted Green GDP Accounting in Chongqing Municipality and Ningxia Hui Autonomous Region, which is of great practical significance. As the only experimental city for accounting designated by NBSC, the research on natural resources and environmental accounting methods[1] was carried out by Chongqing Statistic Bureau[1]. The physical quantification and monetary valuation of water resource and industrial pollution and green GDP of Chongqing City in 1997 and 2002 were also completed. Combining with input-output tables of Ningxia in 1992 and 1997, Yearbook of Ningxia Autonomous Region in 1990's and other related data, green input-output calculation tables for resources, energy, economy and environment in 1992 and 1997 were worked out by Peking University. On the basis of that, actual green accounting analysis was conducted in Ningxia region.

1.3 Latest development of research

Recently, the research on SEEA at national level has been conducted in the following five aspects: first, Research on Chinese System of Integrated Environmental and Economic Accounting (SEEA) or Green GDP was jointly conducted by SEPA and NBSC. Under their leadership, the survey on green national accounting and environmental pollution cost was made in ten candidate provinces and cities. The research focuses on the establishment of environmental and economic accounting system with the ultimate objective of calculating out environmentally adjusted domestic production (EDP). Second, Framework Research on Accounting of Natural Resources and Environment was jointly conducted by NBSC and Statistics Canada with emphasis on accounting

[1]Project Team of Chongqing Statistics Bureau for Research on Natural Resources and Environmental Accounting, Research Report on Natural Resources and Environmental Accounting in Chongqing, 2004

system for mineral resources and physical quantification and monetary valuation of environmental pollution. Third, it is the Forest Resources Accounting Program jointly conducted by NBSC and the State Forestry Bureau. Fourth, Water Resources Accounting Research was conducted by NBSC and the Ministry of Water Resources with financial support from Statistics Agency of United Nations. Fifth, Marine and Fishery Resources Accounting was launched by the State Oceanic and Fishery Administration. The experimental work was started in Hebei Province. Let's focus on the introduction to the progress of the study on Chinese Environmental and Economic Accounting and the survey made in ten experimental provinces and cities under the support of SEPA and NBSC.

2 Framework Research on Chinese Environmental and Economic Accounting System

2.1 Framework for Environmental and Economic Accounting System

The System of Integrated Environmental and Economic Accounting (SEEA) should include physical and monetary accounts, inputs and outputs accounts for environmental protection, EDP account and etc. Recently, accounting for physical quantification and monetary valuation of environmental pollution and EDP are mainly conducted but temporarily without regard to accounting for inputs and outputs of environmental protection and physical and monetary accounts for ecological damage. Its framework is as shown in Figure 1.

2.2 Technical Approaches for Environmental and Economic Accounting

Technical approaches adopted in accounting are as shown in Figure 2. Its calculation can be divided into three steps: 1) Accounting for physical quantification of pollution consisting of generation, treatment and discharge of pollutants; 2) Accounting for monetary valuation of pollution which refers to making calculation on actual cost and hypothetical abatement cost (HAC) for pollution control by using cost-based method and making calculation on environmental deterioration cost caused by pollutants discharge by using damage-based method; 3) Calculation of EDP.

At present, there are two accounting methods for environmental pollution cost: one is the cost for control of discharged pollutants which is called hypothetical cost for pollution control in the accounting system; the other is economic value calculated for environmental loss caused by pollutants discharge through estimation on pollution cost which is also called environmental degradation cost. Environmental degradation cost is generally calculated by regional units and its adjustment to GDP is only limited to the level of total amount. Therefore, it is kind of difficulties to disassemble environmental degradation cost into different sectors

2.3 Framework for Accounting of Physical Environmental Pollution

Accounting of physical environmental pollution consisting of seven tables includes accounting for discharge, treatment and generation amounts of pollutants in different sectors and regions, which are specifically referring to accounting for physical quantification of water pollution, air pollution, industrial solid wastes and household wastes in different regions and accounting for physical

quantification of water pollution, air pollution, industrial solid wastes in different sectors. The regional accounting scope involves 31 provinces, municipalities or autonomous regions in eastern, middle and western parts of China. The sector accounting scope involves primary industry in which crop production and livestock raising are emphasis, secondary industry and tertiary industry including household pollutants.

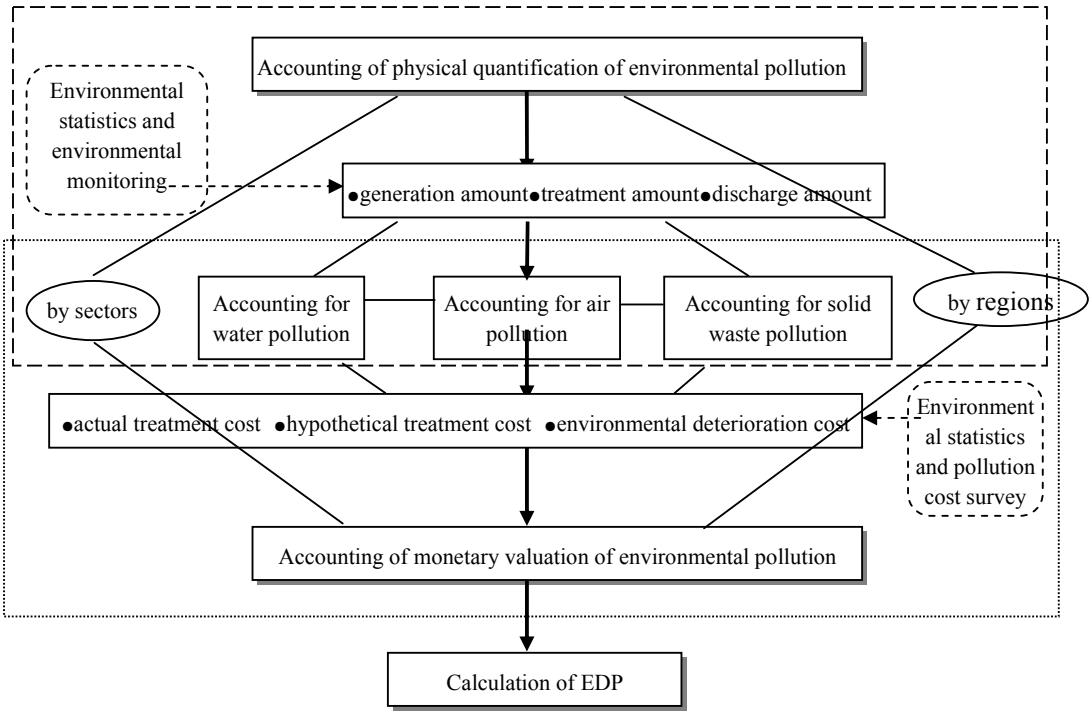

Figure 1. Framework for Chinese Environmental and Economic Accounting System

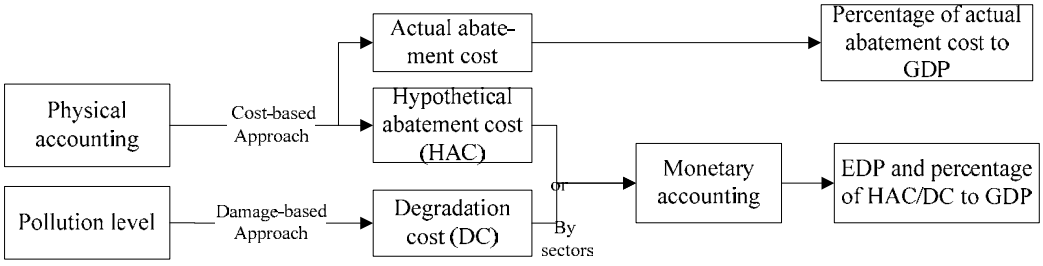

Figure 2. Technical line for Chinese Environmental and Economic Accounting

2.4 Framework for Accounting of Monetary Environmental Pollution

Monetary environmental pollution consists of 1) accounting for money flow relating to environmental pollution in the existing economic accounting which mainly refers to actual cost for

pollution abatement and 2) calculation for environmental deterioration cost caused by pollutants discharge and loss cost by pollution accidents. In line with different accounting methods, environmental degradation cost can be divided into hypothetical cost for pollution abatement and cost for pollution damage.

Accounting of monetary environmental pollution mainly includes the following contents: water pollution accounts, air pollution accounts, industrial solid wastes accounts, household wastes accounts and economic loss by pollution accidents in different regions; and water pollution accounts, air pollution accounts, industrial solid wastes accounts in different sectors. Framework of monetary environmental pollution is shown as Figure 3. Seven corresponding tables for monetary valuation of water pollution, air pollution and solid wastes pollution in Figure 3 could be converted into that for physical quantification which constitutes framework for physical accounting.

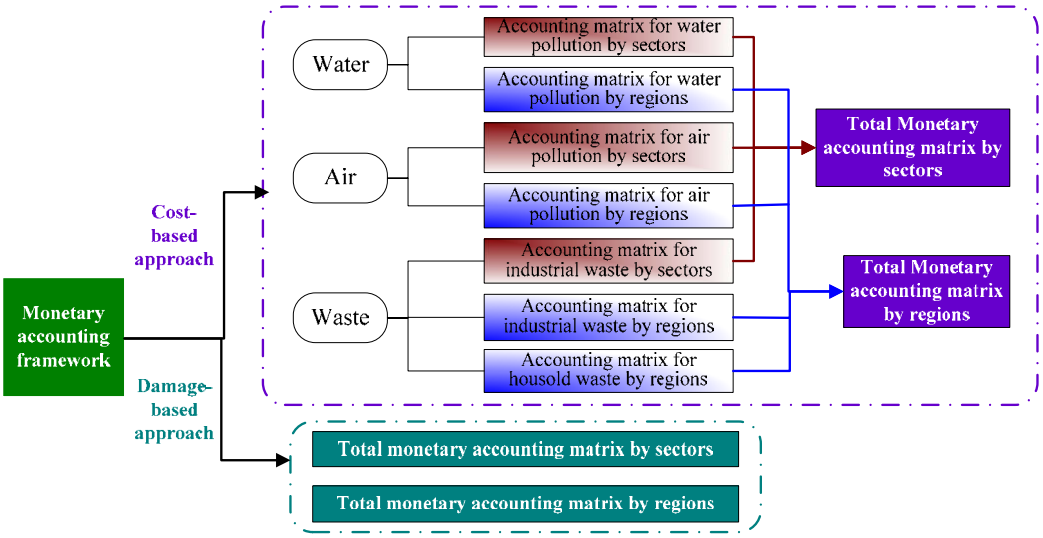

Figure 3. Framework for Accounting of Monetary Valuation of Environmental Pollution

2.5 Environmentally adjusted Production

The total amount of environmentally adjusted production (EDP) could be calculated out through tabulation of accounting results for monetary valuation of water pollution, air pollution, and industrial solid wastes by industries and regions.

There are three calculation approaches: 1) production approach: EDP = aggregate output - intermediate input - environmental cost; 2) income approach: EDP = payment for labor + net production tax + consumption of fixed capital + operation surplus with deduction of environmental expenditure; 3) expenditure approach: EDP = terminal consumption + capital with deduction of environmental expenditure + net export. According to the different deduction of environmental costs, the indices for “EDP of Pollution Cost Approach”, “EDP of Hypothetical Abatement Cost” and “EDP adjusted by the Total Environmental Costs” and others could be obtained. The above-mentioned EDP mainly refers to “EDP of Hypothetical Abatement Cost”.

3 Trial Calculation Results for Chinese Environmentally Adjusted GDP in 2004

Technical Working Group for Chinese System of Integrated Environmental and Economic Accounting conducted a comprehensive trial calculation for physical and monetary valuation of water pollution, air pollution, industrial solid wastes in different industrial sectors throughout the country in 2004 by making use of Abatement Cost Approach, and obtained a preliminary calculation result for Chinese Environmentally Adjusted GDP from the point of view of "hypothetical abatement cost". The preliminary accounting shows that it is feasible to make calculation of environmentally adjusted GDP by means of abatement cost approach.

The preliminary calculation result shows that total hypothetical abatement cost for China in 2004 is 260~300 billion yuan, among of which 64% is for water pollution control, 32% for air pollution control, and 4% for solid wastes control.

Chinese added value of three major industries totaled up to 15988 billion yuan in 2004, while their total hypothetical abatement cost to 260~300 billion yuan, among which primary industry accounts for about 1.6% of the added value of that industry; and the secondary industry accounts for 2.2% of that industry; and the tertiary industry accounts for about 2.9% of the added value of that industry. The proportion of hypothetical treatment cost of three major industries in the added value of each kind is as shown in Figure 4.

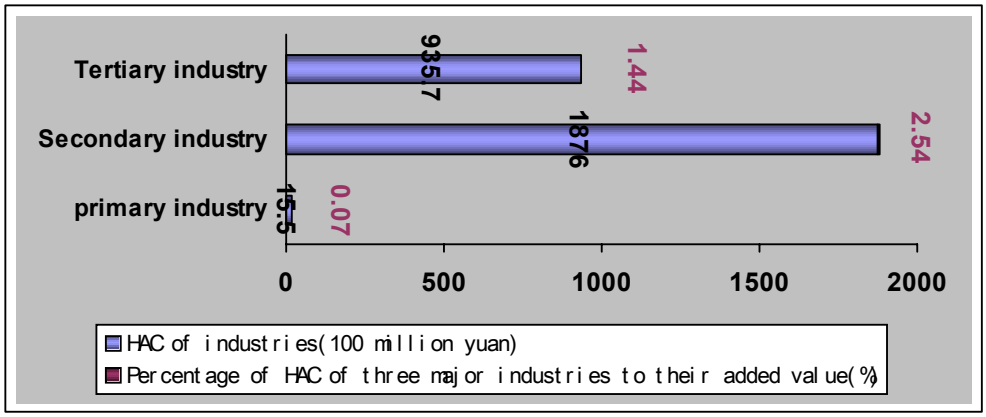

Figure 4. Hypothetical Abatement Costs of Three Major Industries and their Percentages to the Added Values

But here we have to mention that the above calculation results are only trial accounting for pollutants abatement cost per unit by Chinese Technical Working Group for SEEA based on the previous research, which aims to demonstrate the whole accounting framework, approaches and system. The above calculation results will be amended with further survey and analysis. In addition, the research on environmental deterioration cost by using pollution cost method is in progress by Chinese Technical Working Group for SEEA. But due to complex calculation method and abundant basic data are required to be collected, the calculation results will be released at the next phase.

4 Existing Problems and future of Integrated Environmental and Economic Accounting in China

Since the research on green national economic accounting was just launched several years ago in

China, which is of quite weak data basis, it gives rise to much controversy in academic circles at home and abroad. There are also many remarks and discussions on whether green GDP should be established in China or not. We would like to make a brief analysis on the existing problems of integrated environmental and economic accounting in China and look into the future of Chinese SEEA as follows.

4.1 Existing Problems

Regarding potential problems to be confronted in green national economic accounting research in China, many researchers including us have conducted related analysis [3]. Next we would like to make a summary combining our working practices. In a whole, there are following three major problems existed in Chinese SEEA research:

- **Working platform has not been established and the guidance for propaganda is hard to control**

With great efforts of researchers, the basic framework for the Integrated Environmental and Economic Accounting System in China has been constructed. Accounting for resources, environment and economy is of high complexity, which involves many governmental and social sectors such as statistics, environmental protection, water resource, land and resources, forestry, marine management, agriculture and etc. Therefore, cooperation and coordination among different departments or sectors is quite needed no matter in comprehensive green national economic accounting or in partial accounting with different themes, which is organization guarantee for implementation of green national economic accounting.

Even though this trial accounting was jointly conducted by NBSC and SEPA at the national level, it is still very difficult to collect data and information from other related departments no matter by Chinese Technical Working Group for SEEA or at local level. Moreover, it is also very hard to control propaganda guidance without a department as the leading organization, which results in some distortion or exaggeration of the media.

- **Progress of accounting researches are unbalanced and theoretical methods has yet to be improved**

In the viewpoint of progress of domestic researches, great progress has been made in the accounting researches on forest, land and environment, and related experimental work has already been conducted in China. However, accounting researches on some important resources such as water resources and mineral resources, ecological damage and pollution accidents are in slow progress. The accounting theoretical methods are still not mature enough, which also restricts progress of introducing accounting for resources and environment into the national economic accounting system as a whole.

In addition, theoretical methods of integrated environmental and economic accounting have yet to be improved: First, resources valuation theories have not been unified yet. There is also not a unified criterion for the source of value price, valuing methods and model of value computation and great controversy is given rise to that. The breakthrough progress has not be achieved on how to bring resources and environment accounting into the national economic accounting system in way of magnitude of value; Second, substantial progress has not been made on how to integrate

individual resources and environmental accounting into a whole accounting system for resources and environment, and how to identify standout mode of the related physical quantification and monetary valuation.

- **Basic work for accounting is put less value on and accuracy of calculation is barely satisfactory**

Due to insufficient fundamental research and inputs, many difficulties are brought for accounting work. It is very hard to avoid discrepancy on final calculation results. First, basic statistics data and information is deficient. Accounting cannot separate from support of statistics data and materials. At present, data and information on resources, environment, economy, society and population is hard to meet requirements of accounting. Besides, changing statistical index system, statistical method and specification are also obstacles for history review and comparative analysis. Second, inputs for fundamental research are also insufficient. Let' take pollution cost accounting as an example, the percentage of environmental pollution cost in GDP of the same year calculated by different research institutions is ranging from 2.1% to 7.7%. Because of great difference, the actual guiding significance of accounting results is not strong, which is closely related to the insufficient inputs for fundamental research on relations between pollution and human health, agriculture, industry and other imperiled objects to great extent. Third, basic capacity building has yet to be strengthened and a group of statistical accounting personnel with professional proficiency and well equipped with soft hardware at grass roots should be set up.

4.2 Future of SEEA in China

According to the above analysis, in a short term, it is impossible to make an intact integrated environmental and economic accounting in China as required by the SEEA issued by Statistics Agency of United Nations, which also means that the figure of Chinese "Green GDP" is hard to be obtained in a long period. But undoubtedly, the resolutions of the State Council of the Party Central Committee to implement scientific concept of development in all-round way and promote changing economic development concept through green national economic accounting will be unswerving. The state statistical sector and environmental resources sector are embarking upon the establishment of integrated environmental and economic accounting system in China. The accurate "Green GDP" may be a dream forever, but we will not stop our steps for Green GDP. In order to make "Green GDP" research as a long-term task, the following recommendations are put forward:

- **Facilitate coordination among sectors and set up a unified working platform**

The working platform for accounting may be implemented in different ways. The first pattern is that statistical sector should take the lead with participation of related sectors and research institutions. The second one is that the administrative department in charge should take the lead with intervention of statistical sector and research institutions. The third one is that the research institutions take the lead with participation of related sectors and statistical sector. Taking specific implementation phases into consideration, in the initial stage of green national economic accounting, aiming at each thematic accounting, it is appropriate that each administrative department in charge should take the lead in organization of accounting work with coordination of

NBSC and participation of related research institutions under the "Framework for Green National Economic Accounting"; when embarking on comprehensive green national economic accounting on the basis of accounting accumulation, it is appropriate that NBSC should take the lead with support of administrative departments in charge and research institutions to guarantee comprehensiveness and integrity of accounting. Furthermore, coordination and communication among departments at local level should be strengthened much more.

- **Strengthen fundamental research and improve accounting theories and methods**

Accounting for resources, environment and economy is a complex system which not only touches upon a complex economic system but also involves various natural resources and environmental elements. It is confronted with many technical difficulties which are mainly embodied in accounting for environmental monetary valuation. There is also not a set of successful international experience that could be used for reference. Therefore, the emphases of research in the future should be: 1) further improving theoretical framework for system of resources, environmental and economic accounting; 2) further studying technical approaches for accounting of physical quantification of ecological damage and natural resources; 3) further studying accounting methods for monetary valuation of resources and environment.

- **Accelerate establishment of related systems and provide data guarantee**

It is very crucial to strengthen system building related to green GDP in order to guarantee smooth implementation of green GDP calculation. The concerned departments should attach great importance to that and accelerate to set it up and improve it. First, current statistical system for resources and environment should be improved; second, research should be conducted on how to formulate environmental and economic policies such as environmental revenue, environmental compensation, and system of performance of evaluation for governmental cadres or leaders and etc. by means of accounting process and calculated indices of green GDP; third, the related standards, regulations and systems such as unified criterion for green GDP accounting methods and standards, supervision and management system for calculation process, releasing system for calculation results and rewards and punishment system and etc.; fourth, working system of green GDP accounting should be implemented.

- **Make dissemination and education in a proper way and create sound social atmosphere**

To push forward green national economic accounting is an important reform for national economic accounting method and social and economic growth evaluation method, which marks great transformation of traditional economic development concept in China. In order to realize the fundamental transformation, we should overcome many difficulties. First of all, guiding ideology of leaders or cadres at all levels should be rectified and their old economic development concepts should be changed. A qualified cadre should be of sustainable development concept and environmental protection awareness, who should not merely consider GDP growth of one region, but much more take long-term interests of the whole into consideration. Secondly, the sound social atmosphere should be created for smooth implementation of governmental work with characteristic of research by a unified working platform and proper guidance for communication

and education.

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